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TO THOSE who live or work in the Arctic or sub-Arctic regions of Canada, the importance of game animals in the livelihood of Eskimos and Indians requires no emphasis. The indigenous peoples in the area extending from Hudson Bay to the Mackenzie River and from the Arctic coast to the northern portions of the Prairie Provinces at one time depended on the barren-ground caribou as a primary source of food and clothing. For many of those people the caribou was the keystone of their economy.

Today the picture is very different. Once-large herds that numbered in the thousands or hundreds of thousands are either reduced in number or extirpated. Hunting areas that formerly yielded more than adequate numbers of caribou for northern peoples, no longer do so. The disappearance of this vital resource has had, and continues to have, a profound effect on the lives of many Eskimos and Indians.

Several government agencies are directly concerned with the decline in caribou numbers. The federal government is responsible both for the welfare of the people of the Northwest Territories and for the wise management and perpetuation of indigenous Arctic animals. The

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At top:—Unlike their more southerly cousins, the woodland caribou, the barren-ground caribou herd in large numbers and often return to follow the same migration routes year after year. Their well-defined routes make them easy prey for native hunters who formerly depended on the caribou as a primary source of food, clothing and shelter. Canadian Wildlife Service

governments of the three Prairie Provinces also are concerned with the barren-ground caribou, as the winter migrations of the animals take them south into the northern parts of those provinces, where Indians and a few white residents traditionally hunt them.

As a result of the concern of the federal and provincial governments, an extensive study of caribou was undertaken in 1948 and 1949 by the Canadian Wildlife Service of the Department of Northern Affairs and National Resources to determine the numbers and distribution of the animals and to gather as much information as possible about factors controlling their lives. After many thousands of miles of survey flying and many studies in the field, the conclusion was reached that barren-ground caribou were fewer in number than at any time in historical record and that the species was losing more animals each year than were being added to the population by birth. Factors contributing to losses were accidental death and predation by wolves, but the principal factor was the excessive human kill. Destruction by fire of forested areas of winter range also was thought to be a contributing factor in the decline, because of the reduction of the area where caribou could find sufficient food in winter.

Further studies of caribou indicated that the decline was continuing at an alarming rate. In 1950 some 670,000 caribou were estimated on the Arctic mainland of Canada between the Mackenzie River and Hudson Bay, but in 1955 the population was estimated, after the most intensive survey ever carried out, to be about 270,000 animals. The reports of Eskimos, Indians and white residents confirmed the aerial survey figures. The decline continues and the 1959 estimate of the total barren-ground caribou population was 200,000.

The crisis led to an extensive barren-ground caribou research study, the most detailed study a big game species has yet received in Canada. The project, carried out between 1st April 1957 and 31 August 1958, was a co-operative venture of federal, provincial and territorial government agencies. The Canadian Wildlife Service, the Province of Manitoba, the Indian Affairs Branch of the Department of Citizenship and Immigration, and the Northwest Territories Council jointly undertook the major financing of the project. Personnel for the study was provided by the Canadian Wildlife Service, both permanent and contract biologists, and by the Province of Saskatchewan. The National Research Council provided two physiologists for a special study. The research planning and field direction were undertaken largely by J. P. Kelsall of the Canadian Wildlife Service, under the guidance of senior officers of that Service and of a special technical committee, whose members were drawn from interested federal and provincial agencies. Valuable assistance in the programme also was received from many other government organizations, from organizations outside the government and from individuals.

The major phase of the research was an intensive investigation of all aspects of caribou mortality. Causes of mortality may be varied and factors such as accidents, disease and parasites, adverse weather conditions, drownings, wolf and other predation, and human utilization, had to be assessed. Other aspects of caribou biology had to be examined because of possible influences on caribou survival. These included such factors as caribou behaviour and reproductive physiology, the influence of snow conditions on feeding, and the distribution of the animals. In addition, studies of caribou winter ranges were undertaken to assess their value and to determine the effect of forest fires on them.

One means of assessing caribou calf mortality is by counting calves in late winter. In many big game populations, about 50 per cent of the calves born fail to survive their first year of life. After that deaths are usually distributed rather evenly throughout the various age classes. By counting caribou calves in late winter, it is

Caribou-skins provide a summer tent and clothing for these Eskimos. Manitoba Game Branch

Caribou are the only deer native to North America in which the male and female bear antlers. The cows shed their antlers about the time the fawns are born, in May or June; the adult bulls shed theirs in early winter. Opposite:—The caribou exhibit in the Museum of Natural History, Regina.
Saskatchewan Government

possible to estimate the recruitment, the number of animals added to the population that year, and that technique was employed in the present study.

It was decided early in the planning of the investigation that principal attention would be directed to a specific segment of the seriously reduced herds on the mainland barren-grounds between Hudson Bay and the Mackenzie River. In March 1957 a herd of about 100,000 caribou wintering in northern Saskatchewan was selected for investigation. Its large size and its proximity to Yellowknife, in the Northwest Territories, presented practical advantages for the study. After the herd had been selected, plans were made to support field parties in such a way that the herd was kept under observation the year round. Aircraft were used extensively to move field camps as the caribou migrated from one seasonal range to another, and to keep track of the herd movements, changing numbers and composition. The field camps were dispersed from Stony Rapids in northern Saskatchewan east to Duck Lake in northern Manitoba and north to Beverly Lake in west-central Keewatin District. Winter studies were carried out from headquarters in Stony Rapids and summer programmes from Yellowknife. In all, about 155,500 miles were flown during the study. Travel in winter by the more conventional northern means of dog teams involved about 2,000 miles, and more than 1,000 miles were travelled by canoe in summer. A team of investigators at a field camp consisted usually of one biologist and one field assistant, but frequently other personnel were present to carry on specialized studies.

The masses of data obtained during the study have been evaluated and a technical report is being prepared. Tentative conclusions can be given about the principal causes of caribou mortality. However, before presenting some of those conclusions, it would be desirable to examine an important phase of the concurrent efforts undertaken to improve caribou numbers.

An extensive wolf control programme has been carried out in the Northwest Territories and in the Provinces of Manitoba and Saskatchewan. The decision to embark on such a programme was predicated on the belief that any practical means to reduce the annual loss of caribou should be put into effect. The net effect of wolf predation on caribou populations was not known, but there was abundant evidence to indicate that wolves killed caribou regularly. As caribou numbers were declining at an alarming rate, it behoved responsible agencies to take all positive steps to prevent unnecessary loss. The programme was not to be one of extermination. It was designed to reduce the

total population of wolves and keep it at a low level until, by management, caribou once more were relatively abundant.

Wolves in northern Canada appear to be of two "types", timber wolves and tundra wolves, although their taxonomic status has not yet been determined satisfactorily. On the barren-ground caribou range, timber wolves are largely restricted to the forest and they prey on the caribou only during the winter months, at the times when the caribou reach the areas where they live. The tundra wolves are not year-round residents of any restricted area. For two months in the spring they remain near their dens on the tundra and subsist on what they can capture or scavenge in the neighbourhood. When the pups are old enough to travel they seek out the caribou herds and for the rest of the year remain in close association with them, living mainly on caribou. A programme to curtail wolf predation on caribou had to be developed around the different habits of the two types of wolves.

A concerted effort to reduce wolf numbers in the range of the barren-ground caribou in the Mackenzie District of the Northwest Territories was initiated by the Northern Administration and Lands Branch of the Department of Northern Affairs and National Resources during the winter of 1953-4. At the same time experimental wolf control was started by the Canadian Wildlife Service of the same Department to determine the most effective methods of wolf control and to assess the effect such control would have on populations of wolves being depleted. Additional technical data on the biology of wolves, such as movements, population structure, reproduction and diseases, also were obtained. Since that time the control programme has been expanded to include parts of the District of Keewatin. In the summer of 1957, wolf-den hunting was introduced, with Indians and Eskimos from four settlements in the Territories participating.

Since the winter of 1955-6, the Manitoba Game Branch has co-operated in the predator control programme in the southern Keewatin District by including it, at federal government expense, as an integral part of its operations in northern Manitoba. The Province of Saskatchewan also has carried out wolf control programmes in the northern portion of that province.

The basic method of baiting wolves has been the use of buffalo or caribou meat poisoned with strychnine. Because of the potential danger to humans and their dogs, particular attention was given to publicizing locations where poisoned baits were set out, with warnings to keep dogs away.

Wolf predation is thought to be a principal factor in caribou mortality. Here a large bait impregnated with strychnine is being set out on a frozen lake. A hole is drilled through the ice and the water is used to freeze the bait to the ice preventing it from being dragged away.

Manitoba Game Branch

Layout of standard set known to trappers. The bait is in line with, and equidistant from, the spruce trees. The trees serve to attract the wolves bringing them close to the bait. As many as nineteen animals have been taken at one of these baits. The sign is a warning to trappers to keep their dogs away.
Manitoba Game Branch

To be effective, poisoned baits must be placed where wolves occur in some numbers. Wherever caribou concentrate there are usually many wolves, so the baits were placed at selected locations either on caribou wintering areas or on their migration routes. The baits were placed by two methods. Aircraft were used extensively to set out numerous baits scattered over large areas. The method was both efficient and rapid. For setting out many baits in limited areas seven experienced northern trappers were hired as predator control officers. Last winter an Eskimo, Joseph Otoayok of Pellatt Lake, also was hired. Those officers were placed in key areas and put out baits with the aid of dog teams. In nearly all cases bait stations were located on frozen lakes so that, if the baits could not be retrieved before the ice melted in spring, the poisoned meat would float away and disintegrate, and there would be no further risk of poisoning other animals. Setting the baits out on the open lakes was also done to take advantage of the travel habits of wolves, which often travel in the open. Other animals, such as foxes and marten, tend to keep to the protection of the forest.

Bait stations were visited periodically to observe their effectiveness, and in the spring were destroyed, if possible, after all the information available from them had been obtained.

A total of 5,166 wolves is known to have been killed in the Northwest Territories as a result of the control programme during the winters from 1953-4 to 1958-9 inclusive. Most of those wolves were destroyed in southern and eastern Mackenzie District. At least 1,418 other wolves were taken by officers of the Province of Manitoba in their campaign in the northern part of that province in the years 1955-6 to 1958-9 inclusive. Additional wolves were killed in the Saskatchewan Government programme.

By the summer of 1957 the Wildlife Service was confident that the timber wolf population was no longer a threat to wintering herds of caribou. Fewer tundra wolves are now being taken because their population has been reduced, but the point has not yet been reached where their threat to caribou can be discounted.

There is no danger that wolves will be exterminated as a result of the control programmes. That would be undesirable from at least two points of view. The wolf is regarded as an integral part of the wilderness environment which should be allowed to perpetuate its kind

A trapper displays pelts of two timber wolves.
Manitoba Game Branch

as long as its actions do not threaten the existence of other wildlife species or seriously conflict with the legitimate interests of man. Cost is also a consideration. Beyond a certain point, the cost of killing wolves exceeds the possible benefit. At that point any game administration must have serious reservations about carrying the control programme any further.

Wolf control in the Northwest Territories will be continued in the light of the latest biological information available about its effect on both the wolf population and the caribou population it is designed to protect. When caribou numbers are again large enough to withstand all forms of mortality, including human utilization and predation, the necessity for intensive control will diminish.

The intensive eighteen-month caribou survey results tentatively suggest that wolf predation may have an important effect on caribou numbers. One Wildlife Service biologist has estimated that the 613 wolves taken from an area where part of the study herd was wintering, could have killed as many caribou as were added annually to that herd segment through births. Until much more information is available, however, such estimations are of limited value.

A number of other mortality factors proved to be of considerable importance, and some proved to be negligible. In the latter category must come disease and parasites. No evidence came to light during the recent study to indicate that either caused the deaths of more than a small number of caribou.

Accidents probably play a minor but continuous role in caribou mortality. Drowning, a form of accidental death, seems to be the greatest mortality factor among the adults, apart from human utilization and predation. There appears to be some drowning every year and under unusual circumstances large numbers of caribou can perish in that manner. In 1951, for example, about four hundred drowned caribou were found along the shores of the Narrows of Aberdeen Lake, N.W.T. They had probably been swamped when a sudden storm caught them swimming the Narrows.

Windchill was suggested as a possible factor in calf mortality by biologist A. G. Loughrey; this suggestion was tested in the field by two physiologists from the National Research Council. Essentially the test was made to determine the effects of windchill on newborn calves. Windchill is measured in units based on the amount of heat the atmosphere is capable of absorbing in an hour from an exposed surface one metre square at a temperature of 91.4° F. In other words, windchill expresses the rate at which the unclothed body of a human loses heat if placed out of doors under given weather conditions.

The possible effect of windchill on calf sur-

Some of the timber wolf heads turned in to a conservation officer in northern Manitoba.
Manitoba Game Branch

A herd of caribou crosses a river near Beverly Lake, N.W.T. Sask. Photo Service

vival was realized when weather conditions at calving time were observed. In early June, when calving commences, high winds, low temperatures, and continuous or frequent precipitation in the form of snow, sleet or rain, can prevail. There is no shelter on the calving grounds and the newborn calf may have to spend the first few hours or days of its life contending with the chilling effects of weather. Evidence has been obtained since 1951 to indicate that mortality of newborn calves, sometimes heavy, has resulted from adverse weather. From the recent windchill studies has come a quantitative relationship between weather conditions and the metabolic response of newborn caribou calves to overcome the resulting body heat loss. The nature of the studies gives some hope that it may be possible in the future to predict the approximate size of the calf crop on a given calving ground, when weather conditions are known.

The intensive research study has clarified many details of caribou biology and mortality. It also confirmed earlier conclusions that human utilization is still the most important single mortality factor. In 1948 the human kill of caribou was believed on good grounds to be about 100,000. In 1954 the estimated kill was about 65,000 and in 1955 it was about 73,000. In each of the latter two years the kill could have constituted about 20 per cent of the entire mainland barren-ground caribou population. During the winter of 1957-8 it was estimated that not more than 15,000 animals were taken. The sharp drop does not reflect improved conservation to any large degree, but merely shows the diminished availability of caribou.

The importance of the human kill becomes apparent when the annual calf crops are considered. During the years 1950 to 1957 the percentage of calves in the herds in late winter exceeded 13 per cent only in 1952. In three of those years, it was less than 8 per cent. The kill of caribou by humans alone was therefore greater than the number of caribou born and surviving the first year of life. When losses by other means, such as accidents and predation, are added to the human kill, it is no wonder that caribou are being extirpated in large areas of the North.

Before the Indian and Eskimo hunters learned to use rifles, the caribou kill was probably less than the calf crop even in years with poor calf survival. The greater mobility of hunters brought about by the increase in dog teams and

. . . A cow and its calf make the trek across.
Sask. Photo Service

the introduction of highly efficient fire-arms increased the total kill beyond the capacity of the herds to withstand it.

The evidence gathered since 1948 leads to one inescapable conclusion. The human kill of caribou alone is sufficient to exterminate the caribou. Unless immediate and effective control is instituted, this once prolific and valuable Arctic resource will be gone.

Recognizing the situation, the federal government has initiated a number of steps to reduce the kill. In the Northwest Territories only the holders of general hunting licences (Eskimos, Indians and a few white old-timers) are allowed to hunt caribou. In the northern portions of the Provinces of Saskatchewan and Manitoba no hunting of barren-ground caribou by white people is permitted. In Alberta, hunting by white residents is confined to heads of northern families who are allowed five caribou a year. The need for caribou conservation has been publicized in the North, among children and adults. Measures have been taken to encourage the utilization of other forms of wildlife, particularly of fish, as food for humans and for dogs. Regulations against wastage of caribou, providing penalties for failure to retrieve carcasses or for feeding caribou meat to dogs, have been enacted and are being enforced. In spite of those measures, however, the caribou situation remains precarious. Calf crops in 1958 and 1959 have been unusually good, but even with good calf crops the herds will barely hold their own, or else will increase so slowly that the full economic potential of the resource cannot be restored in the foreseeable future if the present human kill continues.

For many Eskimos, particularly those who formerly depended heavily on caribou, and for some Indians as well, the caribou may never regain the same economic importance. Efforts by the government to provide new sources of income, schools for children, and employment on defence projects in the North, have brought some of our northern peoples beyond the point where they can revert easily to the old way of life. For those, however, who wish to live in the manner of their forefathers, it is the hope of the governments concerned that caribou may, at some future time, assume a different, additional, and perhaps equally important, role. If caribou once again become abundant, they will provide not only food and other essentials, but may also serve as a source of income to Eskimos and Indians who can act as guides and outfitters to sportsmen. The attraction to southern sportsmen of hunting a trophy animal in an Arctic environment may eventually mean more to some Eskimos in dollars and cents than caribou meat and clothing. The present caribou situation, however, provides little hope for sport hunting in the foreseeable future.

The barren-ground caribou is adapted to living successfully in Arctic and sub-Arctic regions. What a waste of a rich resource it would be, should the species be reduced to a few animals living a precarious existence on the way down to extinction! The caribou, and our northern peoples, deserve a better future than that.

A hunter stalks. The rifle has been largely responsible for the decline in caribou numbers.
Canadian Wildlife Service

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